



BRENT SPENCE
BRIDGE CORRIDOR

Moving the Economy,
Creating Jobs

BRENT SPENCE BRIDGE PROJECT

DRAFT TRAVEL SURVEY ANALYSIS

FEBRUARY 2014



Prepared by Steer Davies Gleave

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1. Introduction

In order to better understand the Brent Spence Bridge market, and to estimate behavioral parameters specific to this market, Steer Davies Gleave conducted behavioral and stated preference (SP) surveys of current Brent Spence bridge users and neighboring competing bridge travelers. The behavioral survey is used to develop data and forecasting model inputs needed for the traffic and revenue study.

This section covers the following:

- The first part describes the survey goals, administration and sample profile results. This includes socio-economic profiles, current Brent Spence Bridge users behavioral characteristics and trip frequencies and patterns.
- The second part focuses on the quantitative behavioral analysis of Brent Spence Bridge users to derive values of time to be used in the modeling, based on stated preferences from the survey and on observed (revealed) travel behavior.

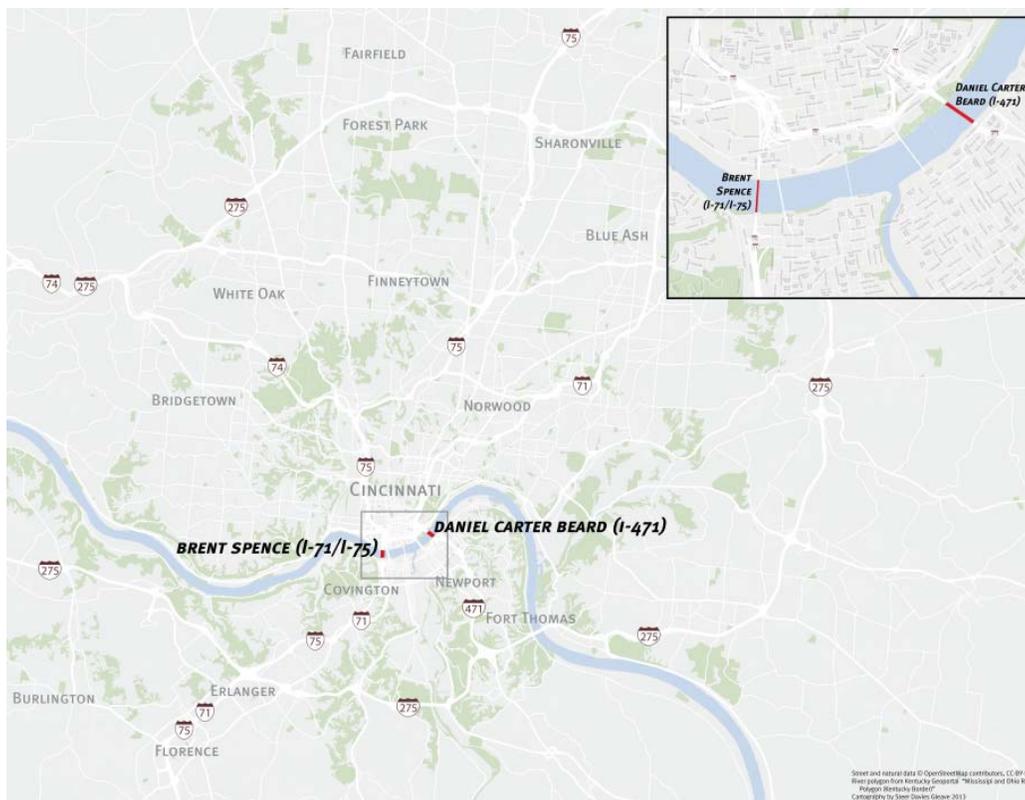
2. Survey Design

2.1 Survey Goals

In order to provide additional behavioral information on the markets served by the Brent Spence Bridge and neighboring competing roads and to establish key forecasting parameters - such as trip frequency and willingness to pay - a behavioral and trip pattern survey was conducted by Steer Davies Gleave.

The Brent Spence Bridge behavioral survey was used to elicit qualitative and quantitative information from drivers who currently make private vehicle (car, van, truck, SUV) trips using Interstates I-71/I-75 or I-471 across the Ohio River between Covington, Kentucky and Cincinnati, Ohio (see **Exhibit 2-1**).

Exhibit 2-1: SP Survey Qualifying Trip Study Area



The survey was designed to collect a wide range of contextual, attitudinal and choice data, as well as, socioeconomic and demographic characteristics of current Brent Spence Bridge users. The socioeconomic and demographic data was important to identify the current Brent Spence Bridge users. Contextual data was gathered to get as much information as possible on the factors influencing people's current trip making characteristic.

Choice data refers to the likelihood that a person might elect to keep using the proposed tolled Brent Spence Bridge in the future, over switching to using one of the free bridges for a similar trip. The choice information was collected using Stated Preference (SP) techniques in order to understand people's preferences, and how they use those preferences to make choices. Finally, attitudinal data was collected to evaluate people's inherent biases and opinions to the proposed project.

The web survey was designed by SDG and administered by Crescent, a market research firm. The main survey was completed between December 3 and December 12 2013, and a total of 1,001 completed surveys were received from a sample of corridor residents.

The goals of the behavioral and trip pattern survey included:

- Developing a qualitative and quantitative understanding of how people make choices between using a toll bridge and alternative un-tolled routes based on attitudinal questions
- Collecting trip pattern information in the markets served by the Brent Spence Bridge and gain insight on frequency profiles of road users
- Collecting willingness to pay for travel time savings information based on stated preference scenarios

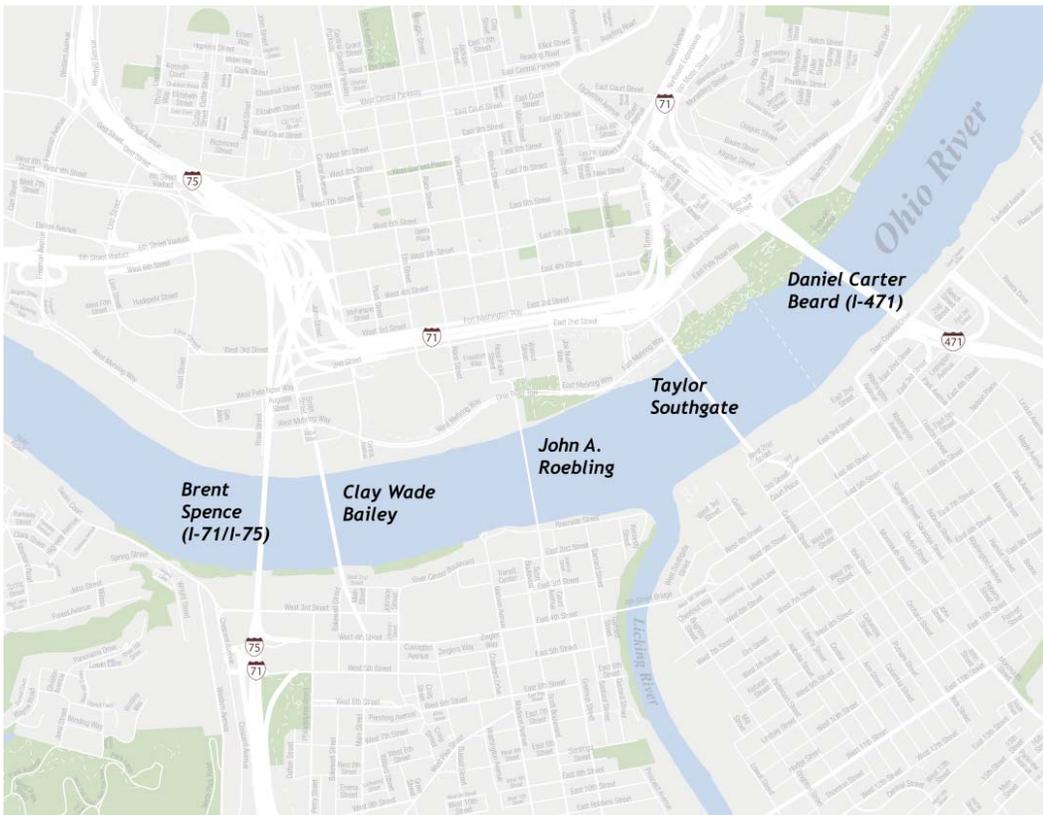
2.2 Survey Design

The survey questionnaire collected revealed preference and stated preference (SP) data.

The revealed preference data gathered information on actual driving behavior, based on respondents most recent trip using Interstates I-71/I-75 or I-471 across the Ohio River between Covington, Kentucky and Cincinnati, Ohio. Travel time, costs and other key information were collected, as well as attitudinal information such as perception of congestion and attitude toward tolling. Other information was also collected, including more detailed data on trip purpose, income categories and behavioral statements to allow further segmentation.

The SP data was collected through a route choice exercise, asking respondent to make hypothetical choices between using the tolled Brent Spence Bridge or the alternate free routes. Exhibit 2-2 shows the Brent Spence bridge and neighboring competing bridges.

Exhibit 2-2: Brent Spence Bridge and Neighboring Competing Bridges



The survey instrument was also designed to collect data on frequency of trips. The survey also collected travelers' knowledge of alternatives, price sensitivity, perceptions of congestion, attitudes about transportation issues such as congestion and tolling, and relevant socioeconomic data.

Various choice exercises were included to assess the willingness to pay of each market. The questionnaire took between 15-20 minutes to complete on average, with about 60 questions for any given respondent - including screening questions and the choice exercise.

The survey was structured as follows:

- Screening questions about trips made across the Ohio River using either the I-71/I-75 Brent Spence bridge or the I-471 Daniel Carter Beard bridge in the last 6 months including trip frequency
- Detailed questions about a typical recent trip across the Ohio River, including:
 - Trip purpose, time and day, and trip origin-destinations
 - Total travel time, perception of congestion
 - Travel costs
 - Next best alternative route / bridge

- Travel party and paying member(s)
- Questions about congestion and other bridges usage
- Introduction to the new bridge project, including questions about respondents attitudes toward the project and alternate route they would be seeking
- Route choice SP exercise consisting of 9 trade-off questions
- Attitudinal questions about perception on tolling
- Socio-economic questions pertaining to respondent income, occupational status, age, transit usage, etc.

2.3 Survey Implementation

Steer Davies Gleave prepared a survey questionnaire that was administered through an online survey to a selected panel of respondents. Steer Davies Gleave developed and analyzed the survey, while the Internet questionnaire was hosted by our partner Crescent Research, a market research firm with a large online panel of respondents across the region. The data were collected via the Internet in December 2013.

Respondents were recruited using the following sampling plan: A target of 1,000 returns or complete questionnaires was selected, a large sample that enables significant market segmentation of road users. A total of 1,001 completed questionnaires were received.

Steer Davies Gleave carefully designed the main questionnaire which was customized interactively for each respondent, based on their answers. For example, respondents are likely to have different behavioral patterns based on their attitude towards using freeways as against local roads. When respondents elected for the Daniel Carter Beard Bridge as their preferred alternate route, the detour presented in the SP exercise was via a freeway with access ramps; while when the respondents chose the Clay Wade Bailey Bridge, the John A. Roebling Bridge or the Taylor Southgate Bridge as their preferred alternate route to using Brent Spence, the detour was via a free route with local roads including traffic signals.

When respondents displayed lower than expected values of travel time savings, additional questions were asked to understand better their choices.

The advantage of using a pre-recruited panel of residents is that no additional incentives are required since the respondents are selected and remunerated by the market research firm. It therefore provides a random sample of residents with lower bias than self-selected respondents.

3. Brent Spence Bridge Travelers User Profiles

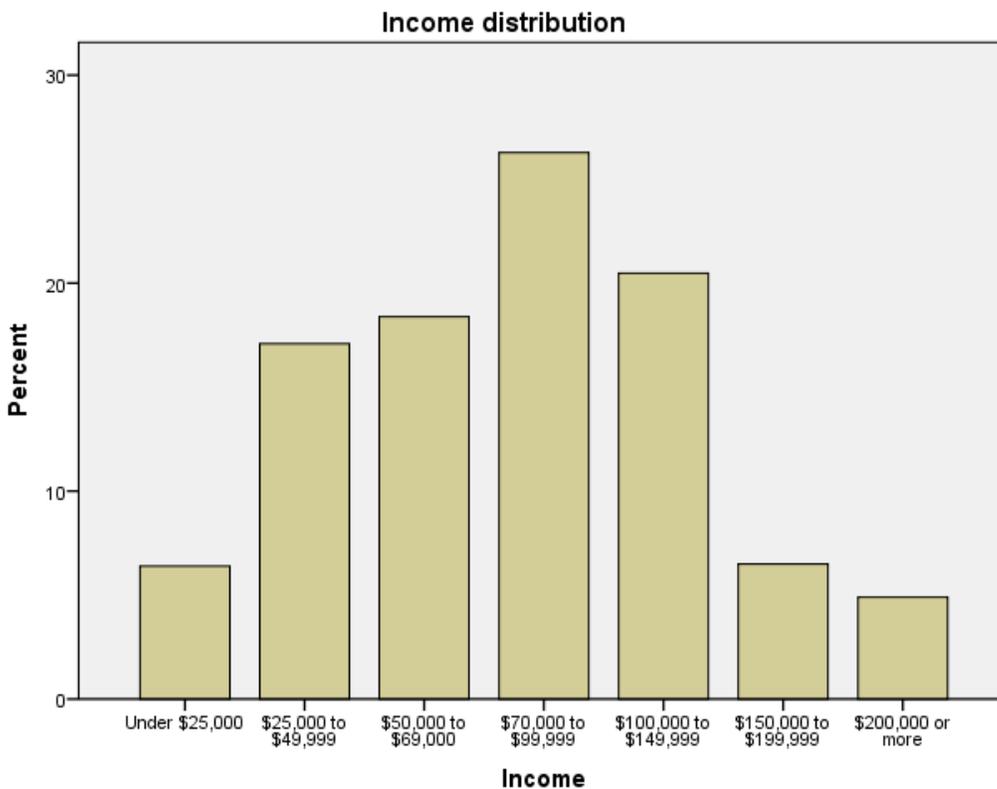
3.1 Sample Size

A summary of the socio-economic and demographic characteristics of the respondents, their current travel conditions, and their attitudinal and travel preferences are presented in this section. Unless indicated otherwise, results below are based on 1,001 respondents.

3.2 Socio-Economic Profile of Bridge Users

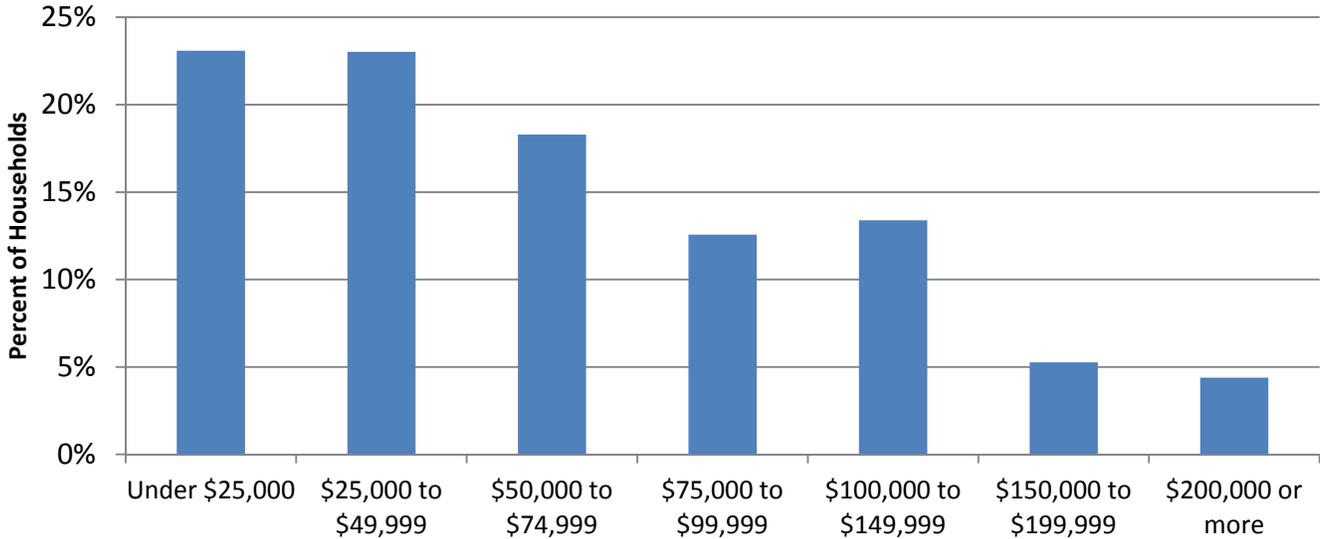
The household income distribution of the bridge users collected in our survey is higher to that of the Cincinnati MSA region¹, as indicated by the exhibits below. **Exhibit 3-1** shows the profile income distribution while **Exhibit 3-2** shows the MSA household income distribution from the US Census bureau.

Exhibit 3-1: Bridge Users Sample Income Distribution



¹ Data from US Census for Cincinnati-Middletown, OH-KY-IN Metro Area

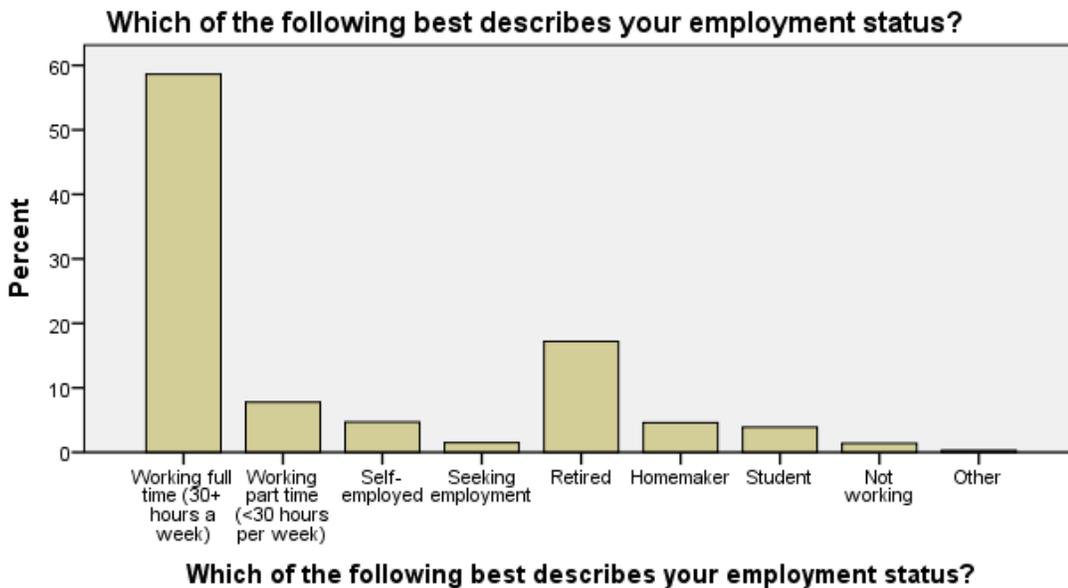
Exhibit 3-2: Cincinnati-Middletown, OH-KY-IN Metro Area Household income In the Past 12 Months



Source: U.S. Census Bureau, 2008-2012 American Community Survey 5-Year Estimates – Household income in the past 12 months (in 2012 inflation-adjusted dollars), Table B19001, Geography: Cincinnati-Middletown, OH-KY-IN Metro Area

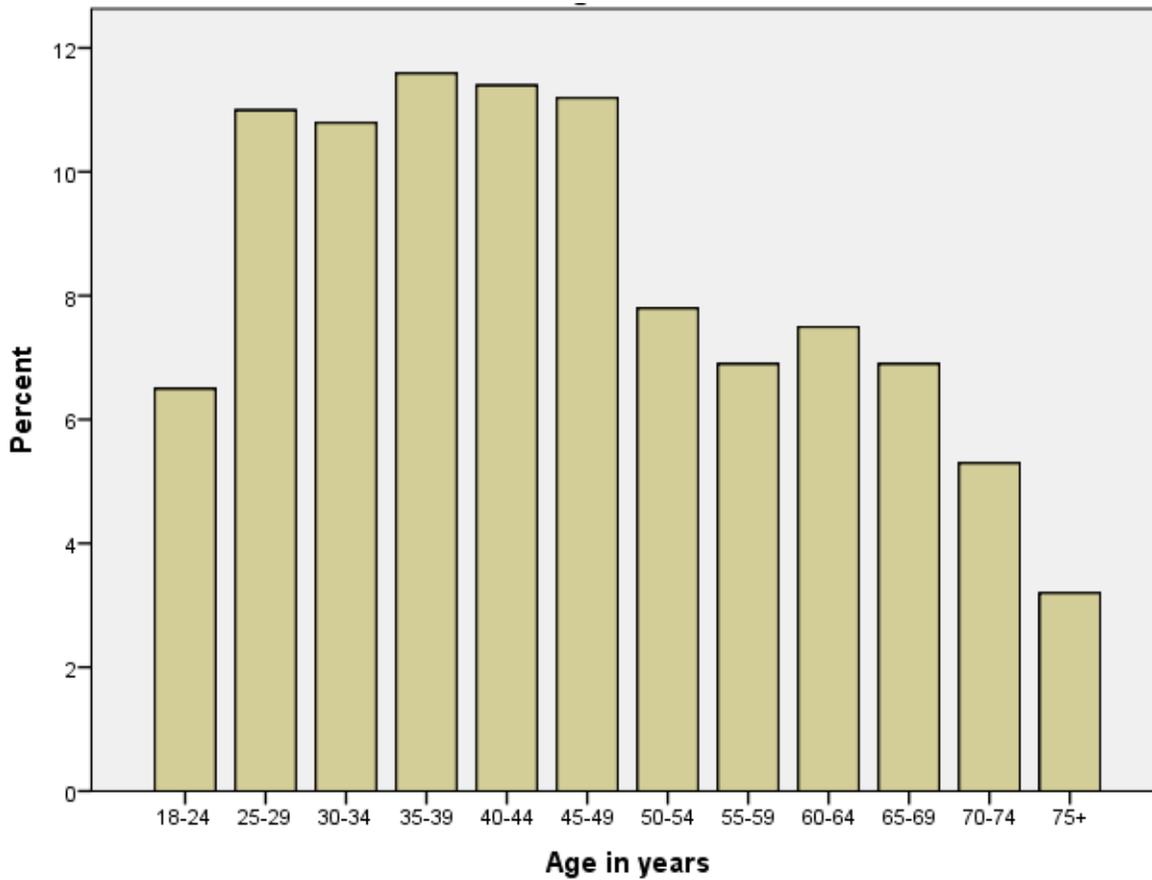
Almost 60% of the bridge users sample collected indicated working full time (Exhibit 3-3), which may explain the higher income distribution.

Exhibit 3-3: Bridge Users Sample Employment Status



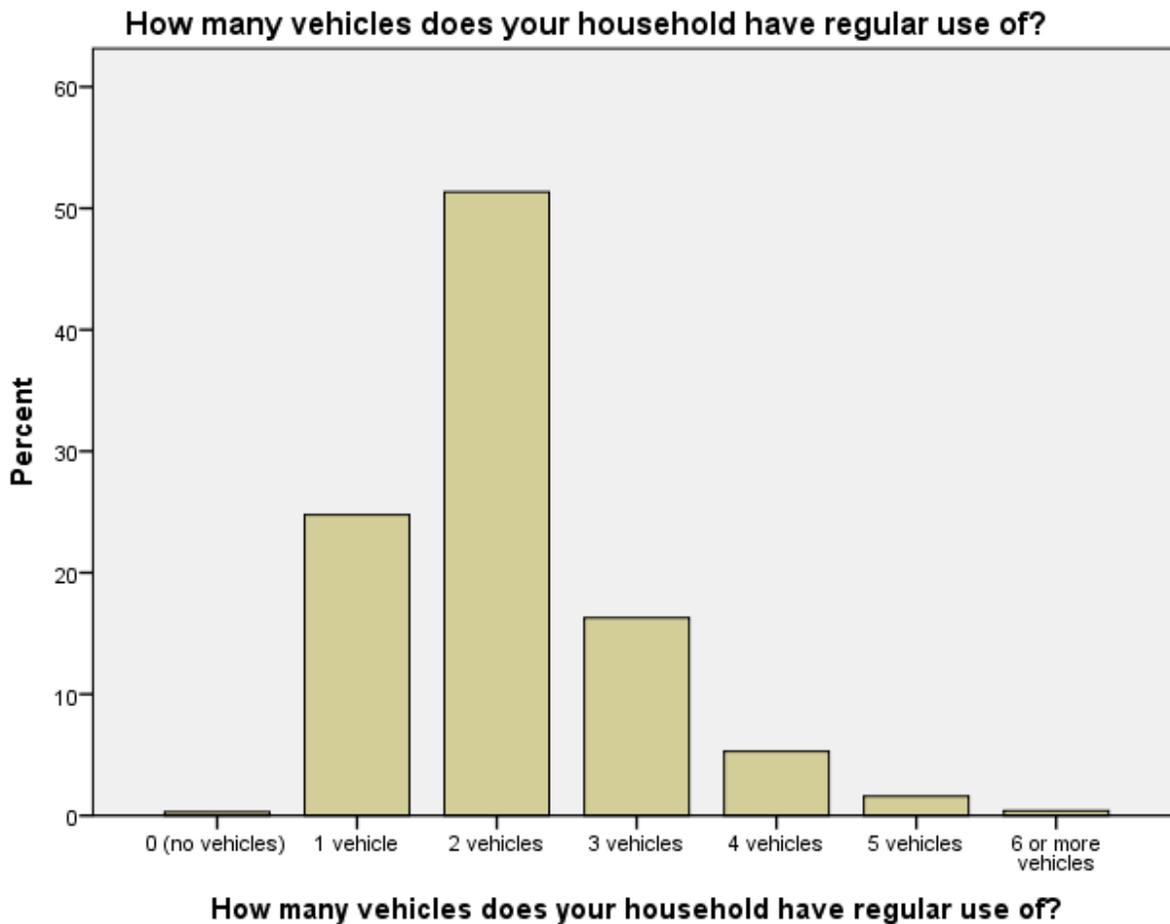
The 25 to 65 years old age group made up most of the responses (**Exhibit 3-4**).

Exhibit 3-4: Bridge Users Sample Age Distribution



75% of the respondents indicated having more than 1 vehicle (**Exhibit 3-5**), also indicating usage of the bridge by higher income households.

Exhibit 3-5: Bridge Users Sample Car Ownership



3.3 User Travel Patterns

The survey collected data on trip patterns for both frequent and non-frequent travelers, as shown in **Exhibit 3-6**.

The survey also collected public transit (PT) usage across the river (**Exhibit 3-7**). Almost 95% of the respondents indicated never or less than once a month using PT to cross the river, indicating that tolling the bridge should not significantly affect PT ridership across the bridges.

Exhibit 3-6: Bridges' Recent Usage

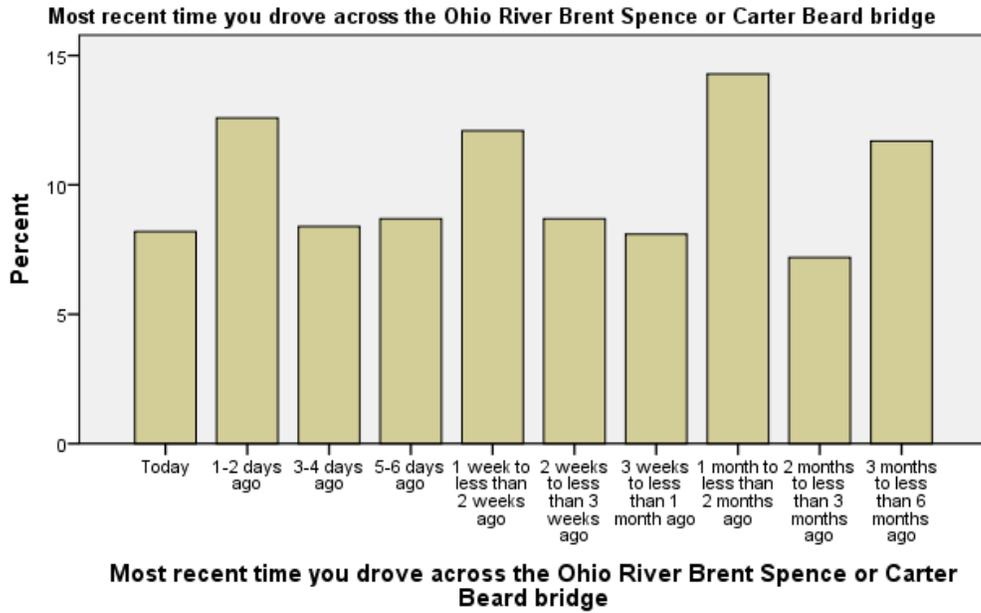
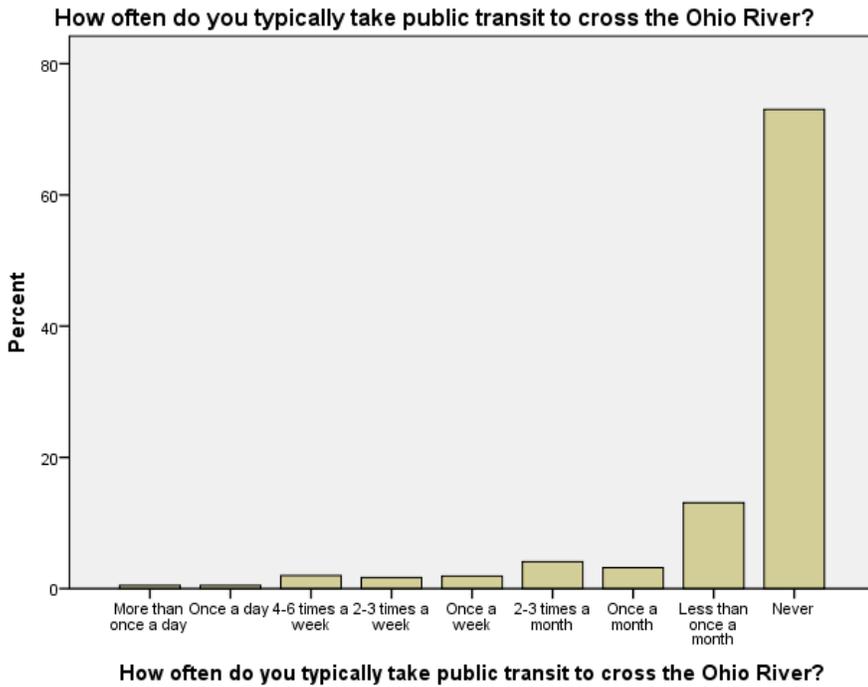


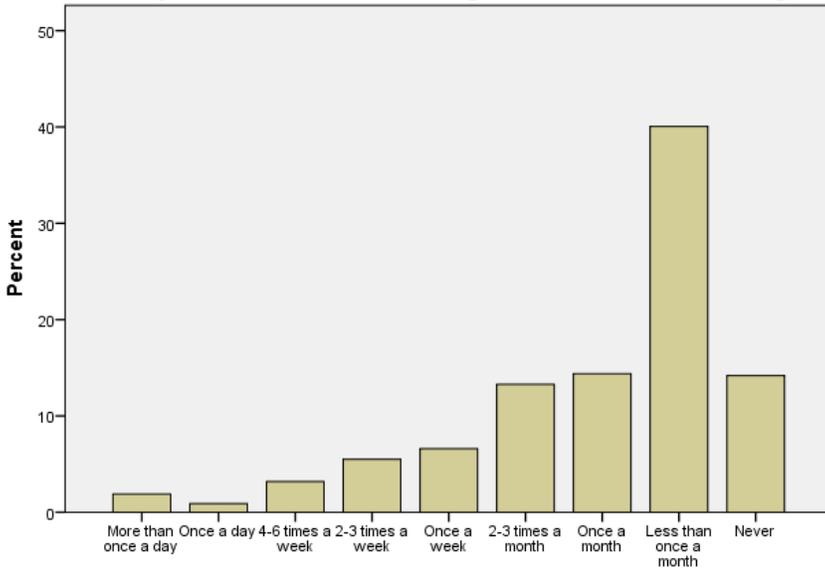
Exhibit 3-7: Public Transit Usage



A large proportion of the respondents indicated using the bridge less than once a month (Exhibit 3-8).

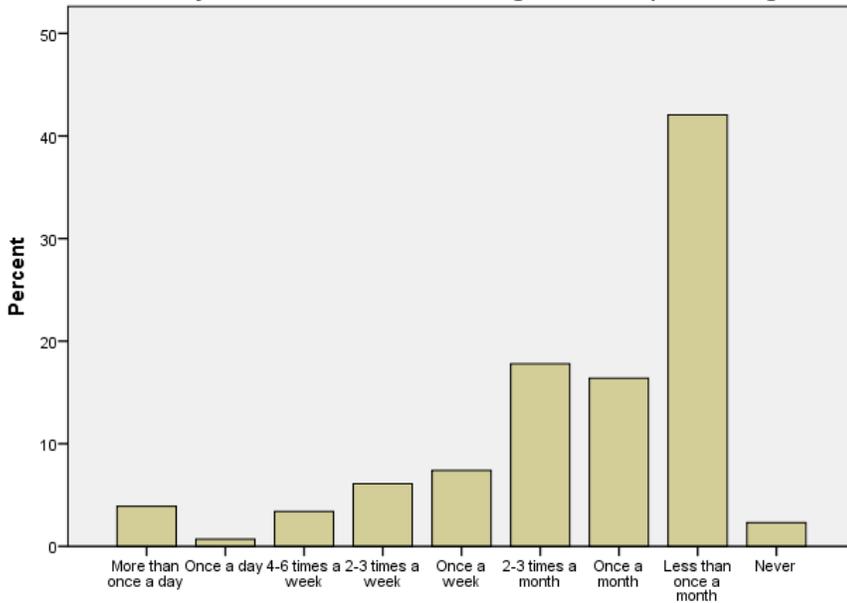
Exhibit 3-8: Bridges Usage Frequency

How often do you cross the Ohio River using the Daniel Carter Beard bridge?



How often do you cross the Ohio River using the Daniel Carter Beard bridge?

How often do you cross the Ohio River using the Brent Spence bridge?

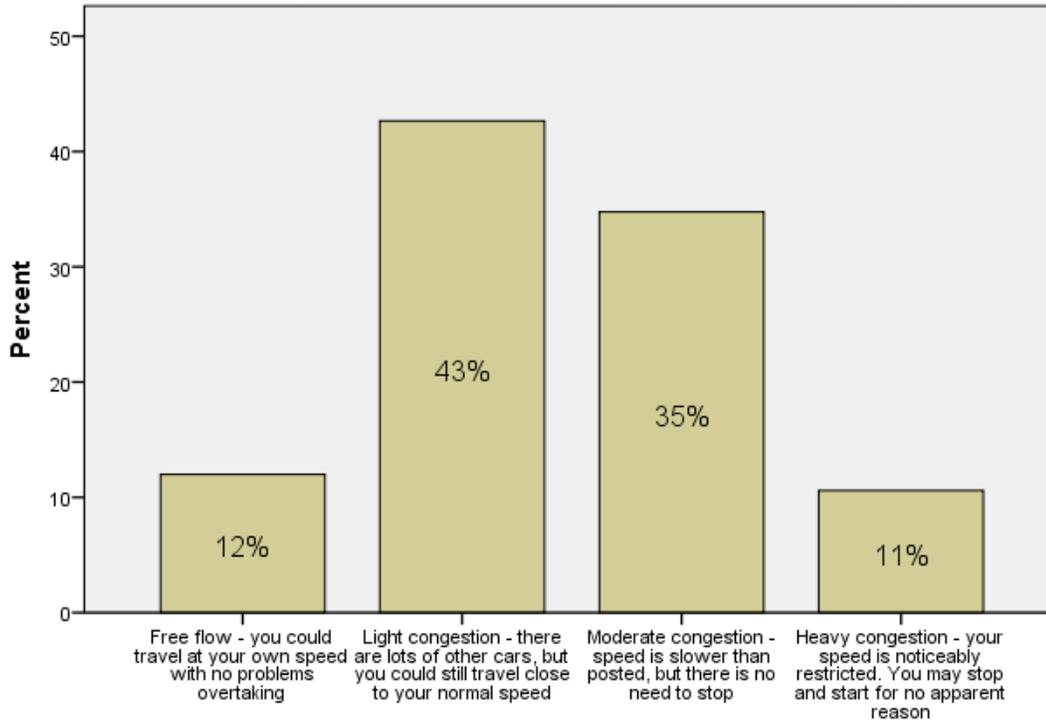


How often do you cross the Ohio River using the Brent Spence bridge?

Respondents were asked to qualify the driving condition during their most recent trip across the river. 88% reported some levels of congestion (**Exhibit 3-9**).

Exhibit 3-9: Perception of Congestions

In general how would you describe the driving conditions during a typical drive



In general how would you describe the driving conditions during a typical drive

A series of questions pertaining to the most recent trip were asked, and summarized below (Exhibit 3-10: Day of the Week, Exhibit 3-11: Trip Purpose, Exhibit 3-12: Origin Location, Exhibit 3-13: Departure Time, Exhibit 3-14: Destination Location).

Exhibit 3-10: Day of the Week

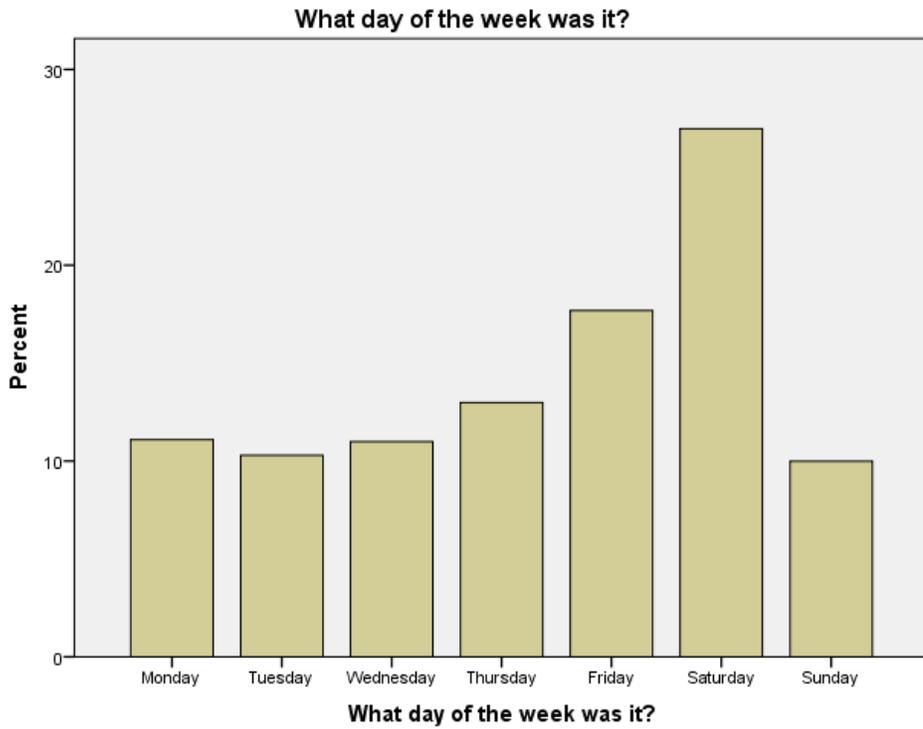


Exhibit 3-11: Trip Purpose

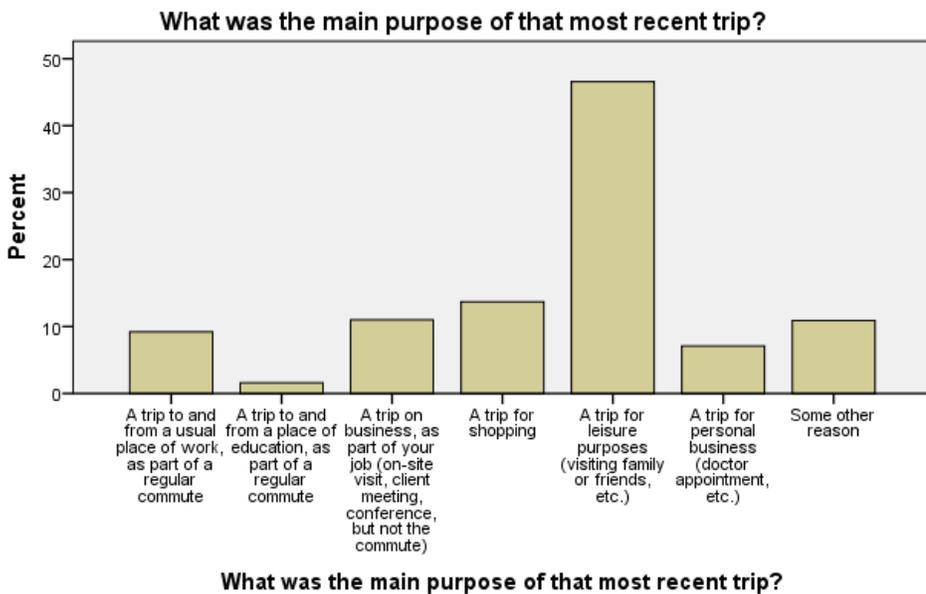
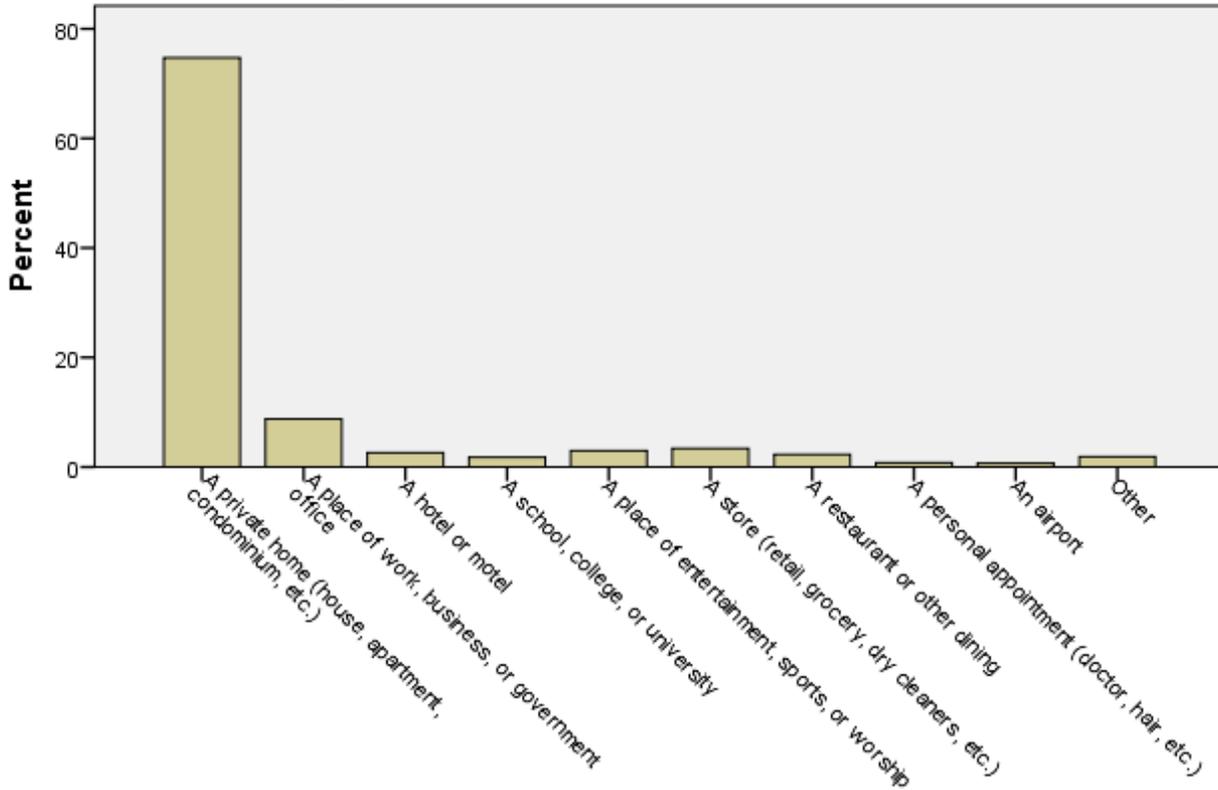


Exhibit 3-12: Origin Location

Which of the following best describes the point where your recent trip started?



Which of the following best describes the point where your recent trip started?

Exhibit 3-13: Departure Time

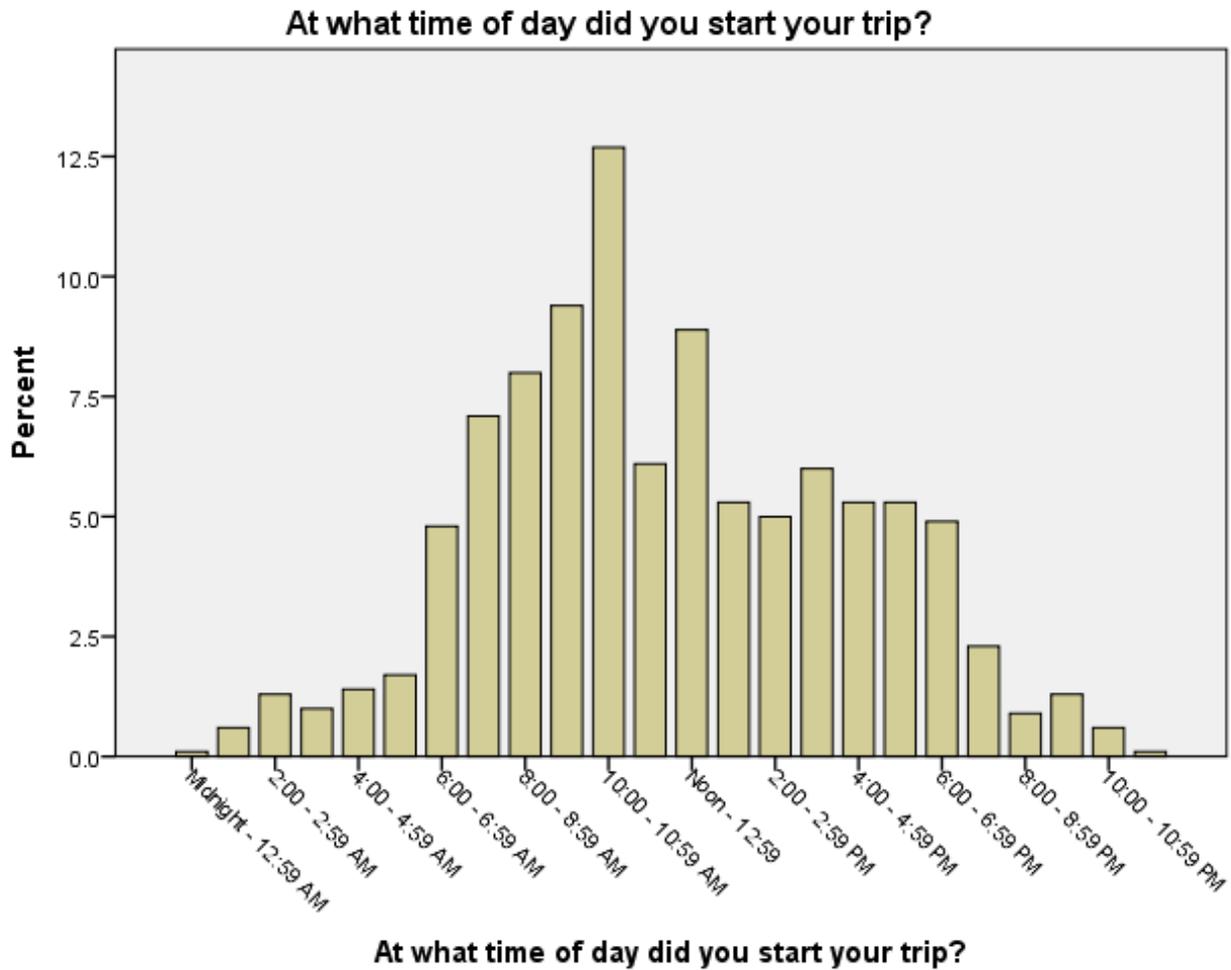
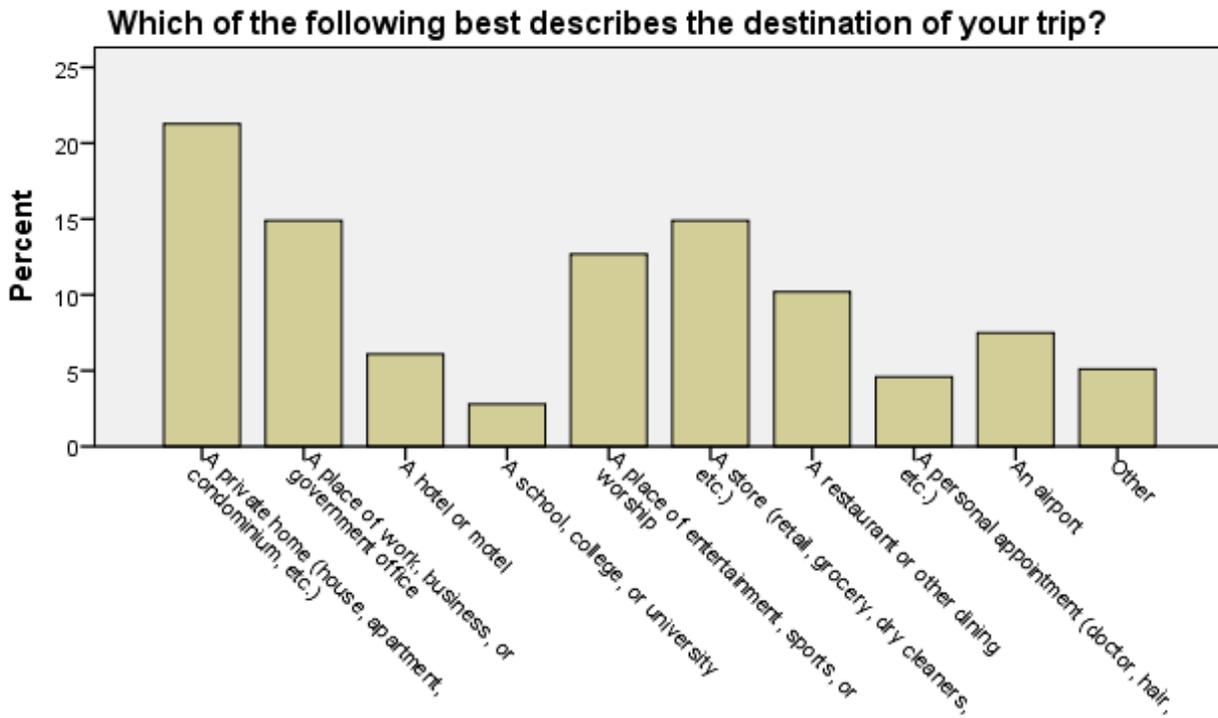


Exhibit 3-14: Destination Location

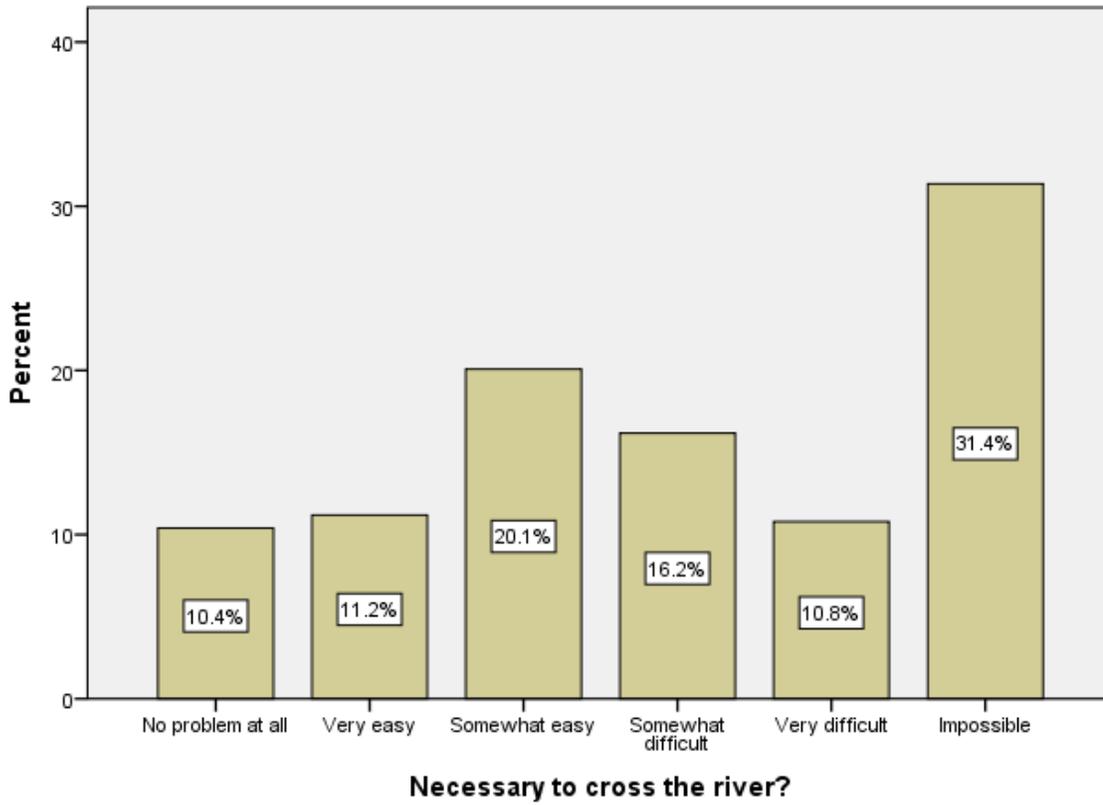


Which of the following best describes the destination of your trip?

More than 55% indicated that it would have been difficult or impossible to conduct the same activity without crossing the bridge (**Exhibit 3-15**).

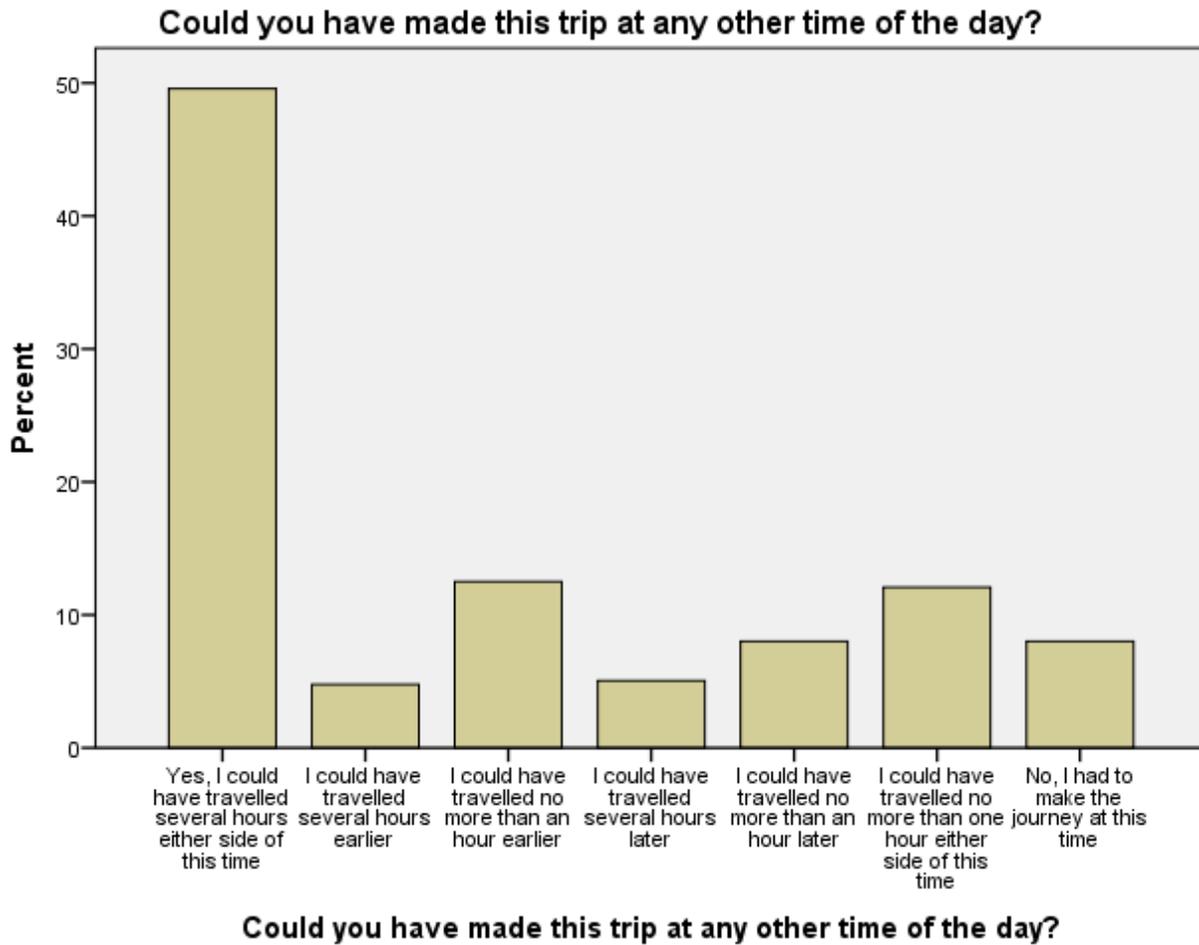
Exhibit 3-15: Necessity to Cross the Bridge

Could you complete the same activity so that it would not be necessary to cross the river?



71% indicated having flexibility on when to make the trip. 50% could have traveled several hours before or after their departure time (Exhibit 3-16).

Exhibit 3-16: Flexibility of Departure Time



Business trips and trips for work showed less flexibility, where most travel could have started no more than an hour earlier or later (**Exhibit 3-17**)

Exhibit 3-17: Flexibility of Departure Time by Trip Purpose

Trip Purpose	I could have travelled several hours either side of this time	I could have travelled several hours earlier	I could have travelled several hours later	I could have travelled no more than an hour earlier	I could have travelled no more than an hour later	I could have travelled no more than one hour either side of this time	I had to make the journey at this time
to and from a usual place of work	19.0%	9.5%	2.4%	16.7%	14.3%	16.7%	21.4%
to and from a place of education	30.0%	10.0%	0.0%	30.0%	10.0%	0.0%	20.0%
on business, as part of your job	39.4%	0.0%	9.1%	21.2%	6.1%	16.7%	7.6%
for shopping	68.8%	4.0%	5.6%	6.4%	7.2%	5.6%	2.4%
for leisure purposes (visiting family or friends, etc.)	52.5%	5.5%	4.7%	10.8%	7.4%	13.2%	5.8%
for personal business (doctor appointment, etc.)	34.5%	0.0%	3.4%	24.1%	13.8%	6.9%	17.2%
For some other reason	34.4%	4.9%	4.9%	14.8%	8.2%	14.8%	18.0%

25% of respondents made stops along the way (**Exhibit 3-18**), and 63% of these indicated choosing the route they did because they had to make these stops.

Exhibit 3-18: Stops Along The Way

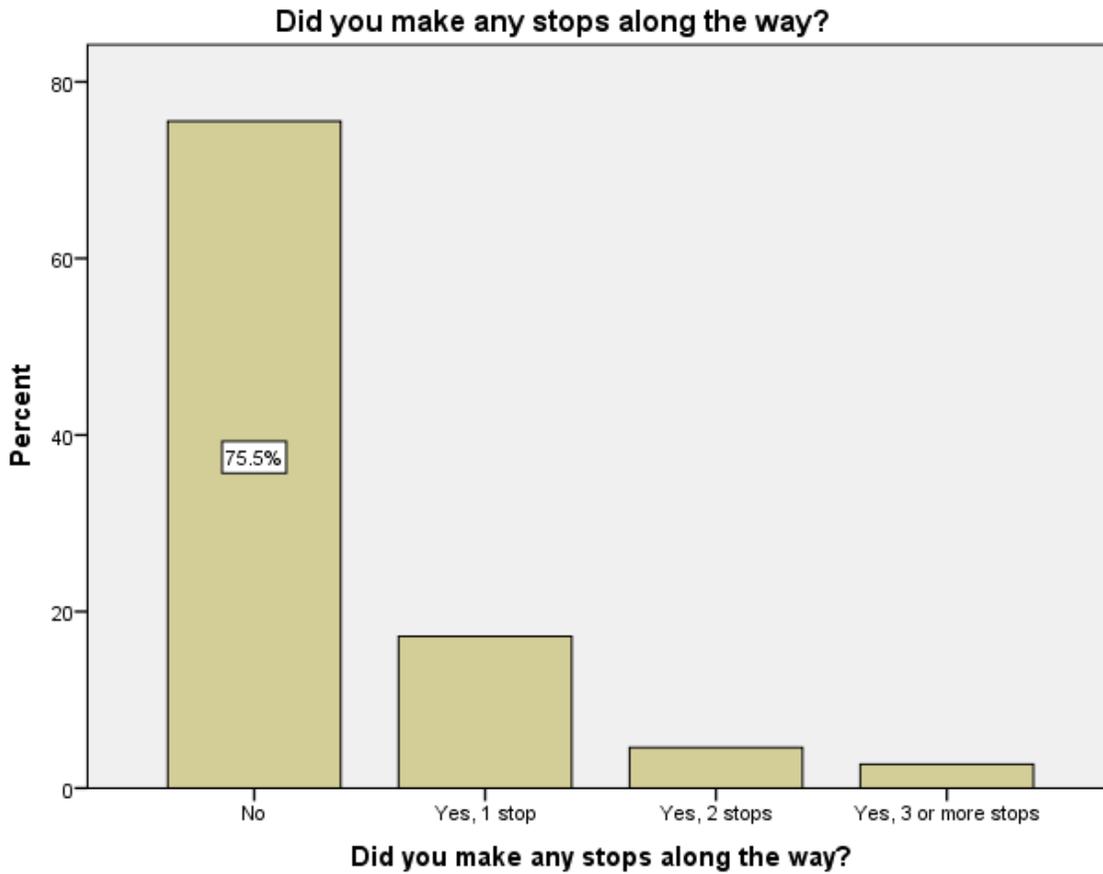


Exhibit 3-19 shows the outbound trip travel time distribution, with a mean travel time of 52 minutes and a median of 35 minutes. The return trip displayed similar (if somewhat slightly higher) statistics with a mean travel time of 54 minutes and a median of 40 minutes (**Exhibit 3-20**).

Exhibit 3-19: Outbound Travel Time Distribution

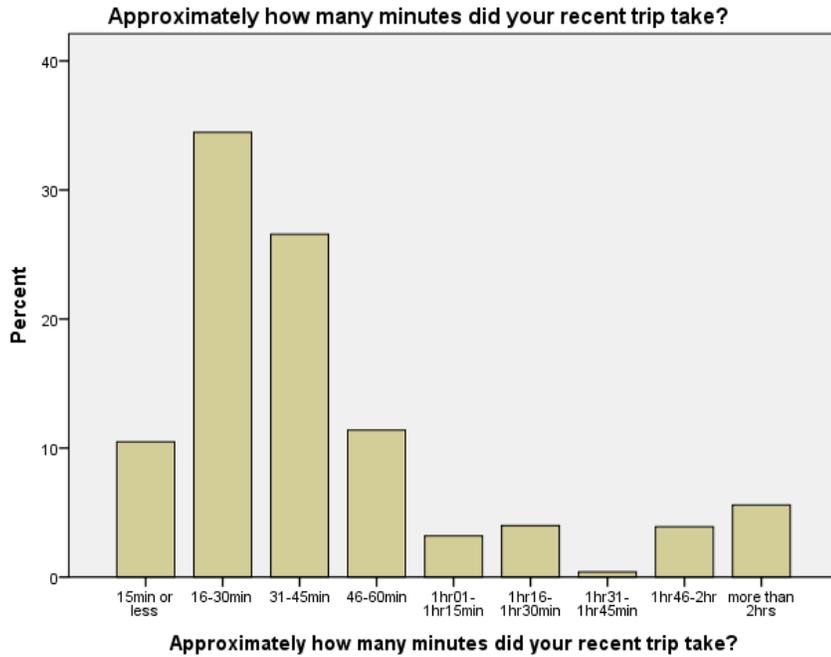
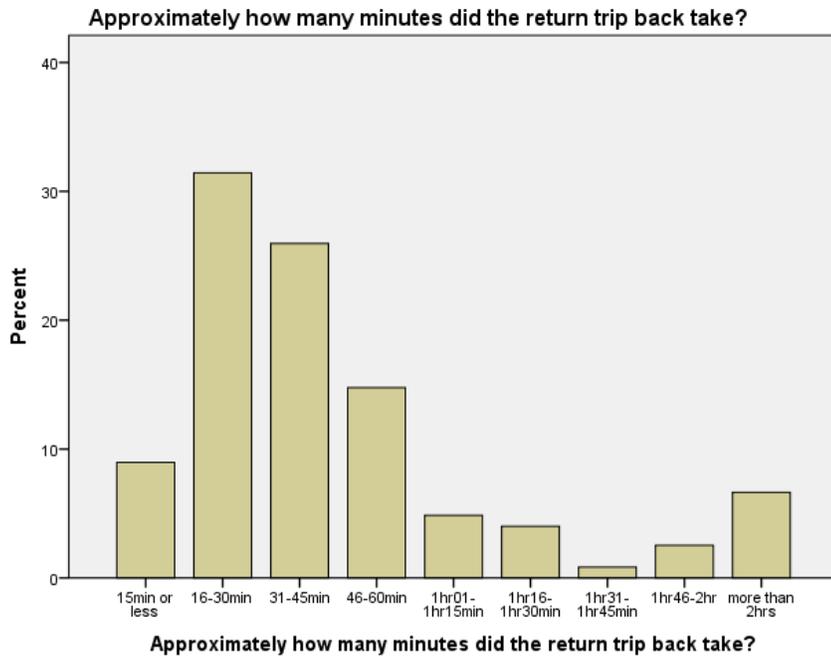


Exhibit 3-20: Return Trip Travel Time



Vehicle occupancy was on average 2 persons per car, with a mean of 2.02 and median vehicle occupancy of 2.00 (**Exhibit 3-21**). Commuting trips have the lowest vehicle occupancy (mean 1.21) as well as business trips (mean 1.41) as shown in **Exhibit 3-21**.

Exhibit 3-21: Vehicle Occupancy

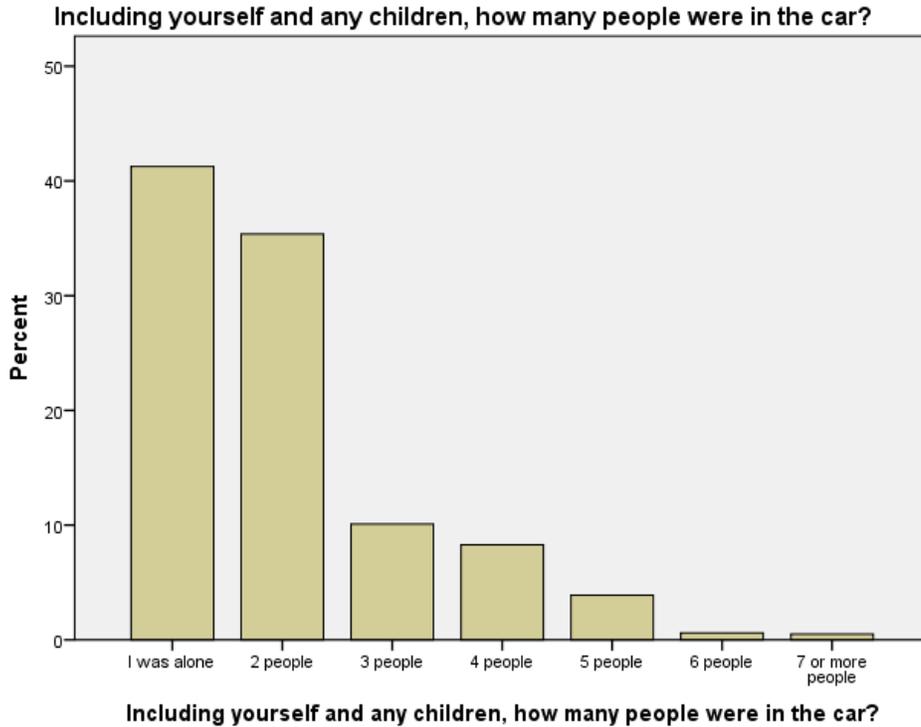
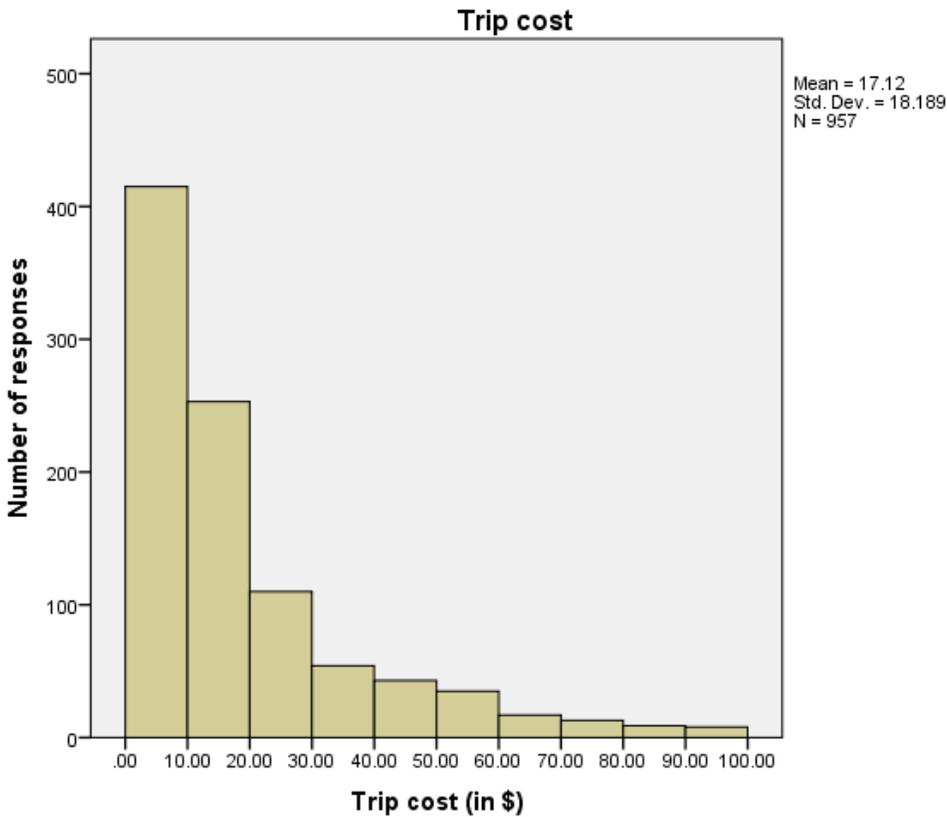


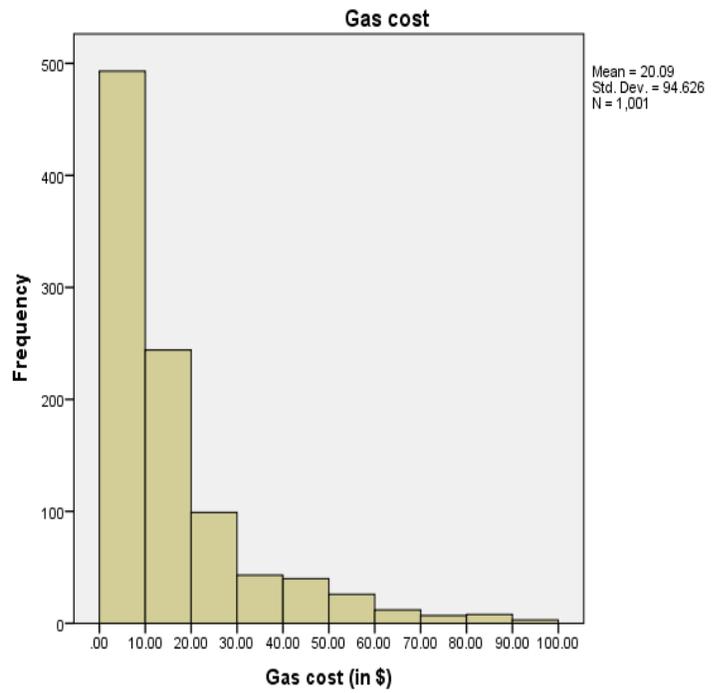
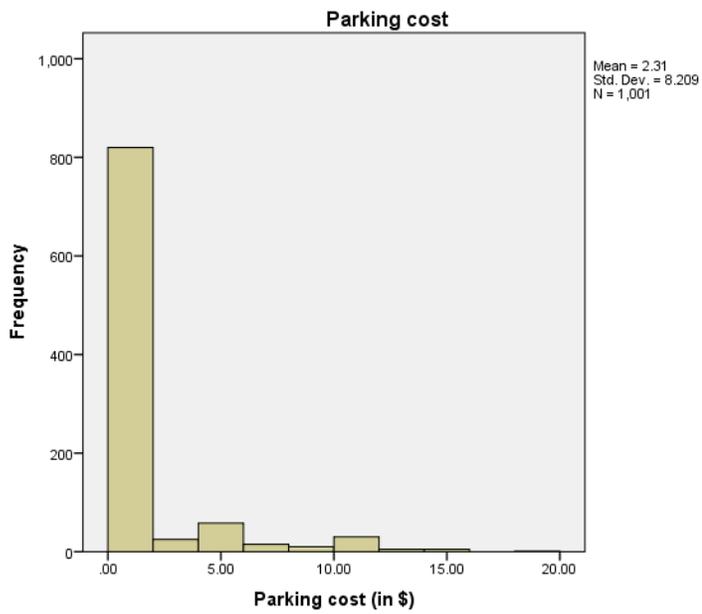
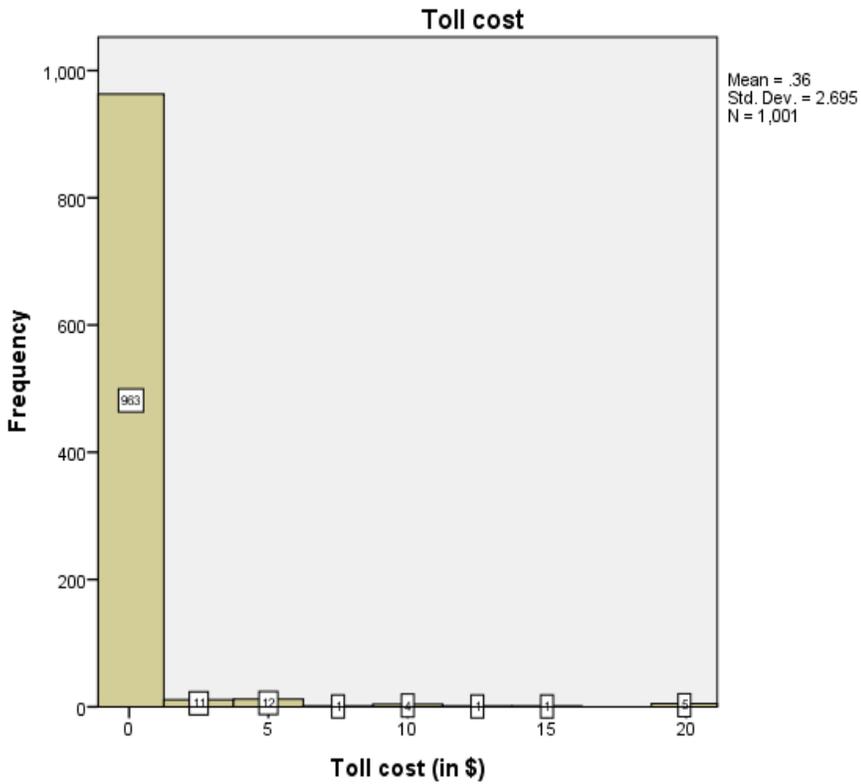
Exhibit 3-22: Vehicle Occupancy by Purpose

Trip Purpose	Mean	Median
to and from a usual place of work	1.21	1.00
to and from a place of education	1.94	1.50
on business, as part of your job	1.41	1.00
for shopping	2.04	2.00
for leisure purposes (visiting family or friends, etc.)	2.40	2.00
for personal business (doctor appointment, etc.)	1.65	1.00
For some other reason	1.92	2.00

The average trip cost (including gas, parking and toll) was \$17.0 (round trip) with a much lower median of \$10 (Exhibit 3-23).

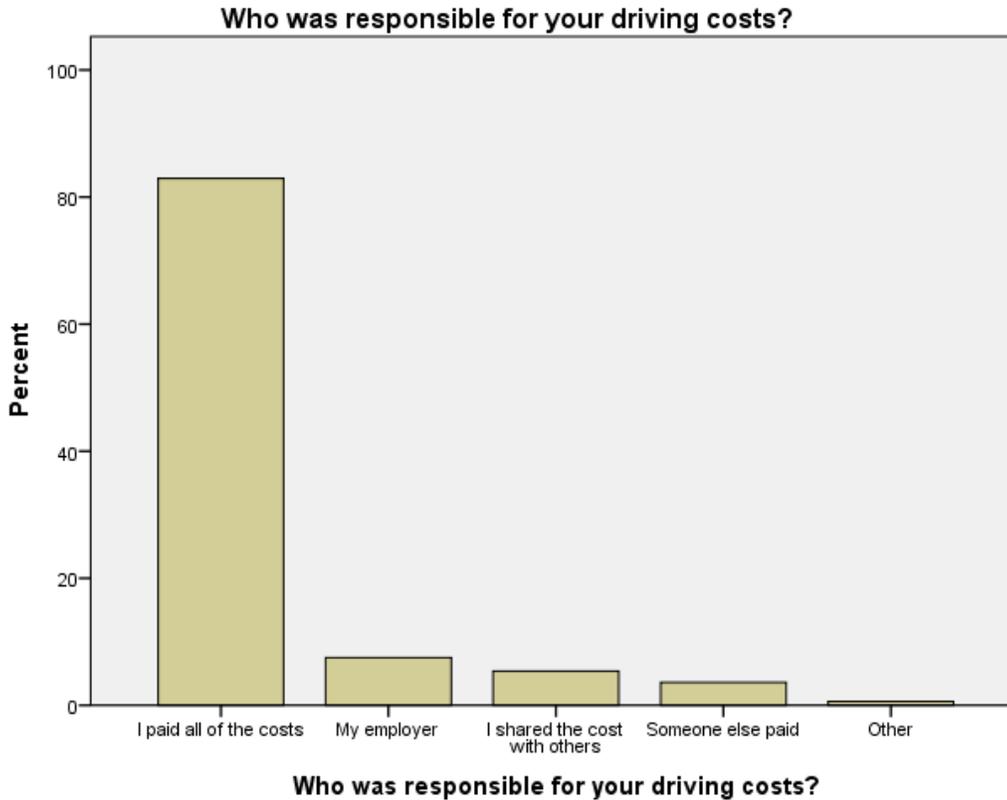
Exhibit 3-23: Round Trip Cost





Finally, more than 80% reported being solely responsible for the driving costs (Exhibit 3-24).

Exhibit 3-24: Driving Cost Responsibility

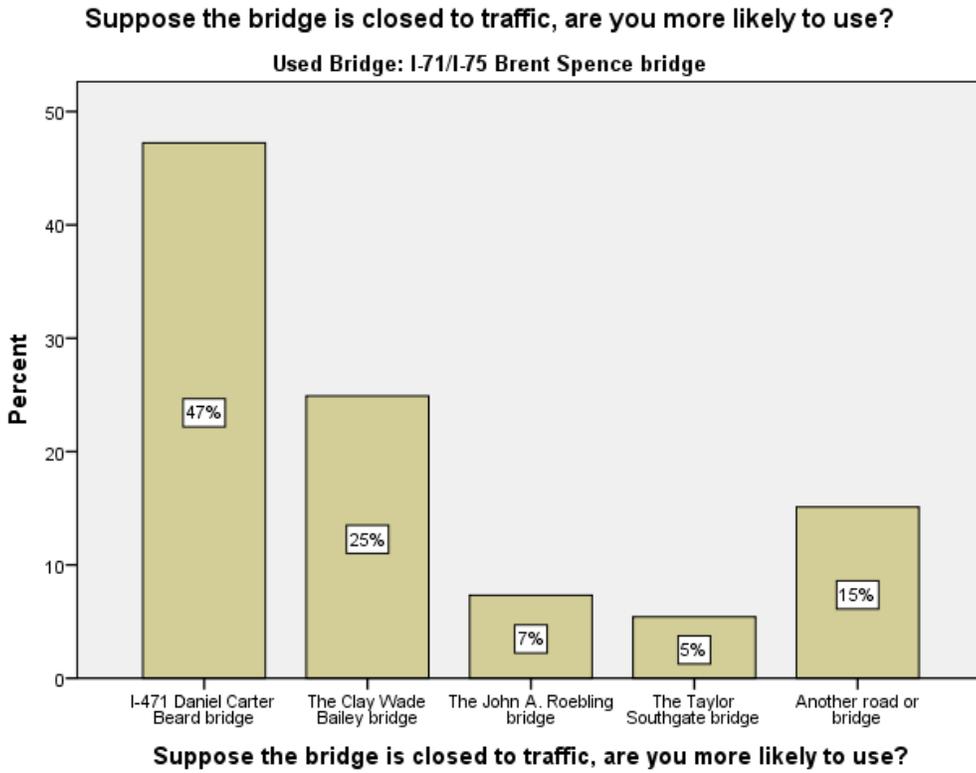


3.4 Attitude Toward Tolling and Alternative Routes

A large section of the survey was dedicated to gaining insight on travelers attitude toward tolling and what their attitude may be once the bridge is tolled.

Respondents were asked which bridge they would use if the Brent Spence Bridge was closed to traffic. Almost half (47%) indicated they would use the Daniel Carter Beard Bridge and 25% the Clay Wade Bailey Bridge (Exhibit 3-25).

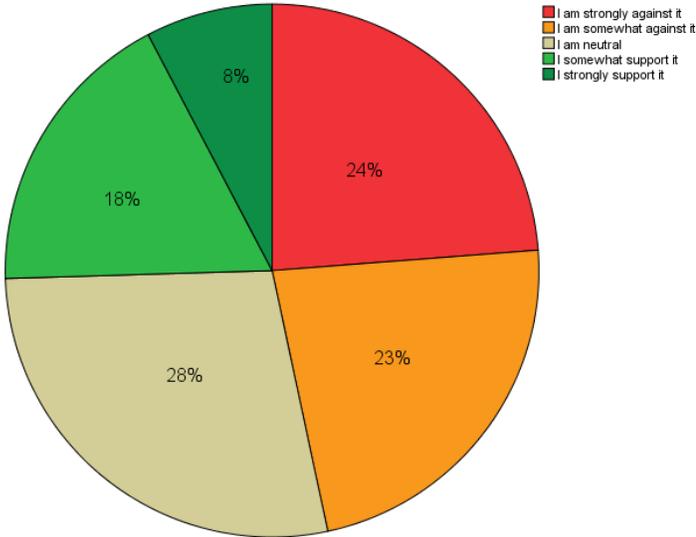
Exhibit 3-25: Alternate Bridge Used in case of Brent Spence Closure



More than half (54%) indicated being neutral or supporting the idea of paying to use the bridge (Exhibit 3-26).

Exhibit 3-26: Attitude Toward Paying to Use The Bridge

What do you think about the idea of paying for using the Brent Spence bridge?



While 40% indicated they will probably use the bridge even if it is tolled, 60% of the respondents indicated they may not use the bridge if it is tolled: of the 60%, 30% were not sure, 20% doubt they will use it while 10% indicated they will most certainly not use it (Exhibit 3-27).

Exhibit 3-27: Attitude Toward Using the Bridge If it is Tolled

Do you think you will use the Brent Spence bridge if it is tolled?

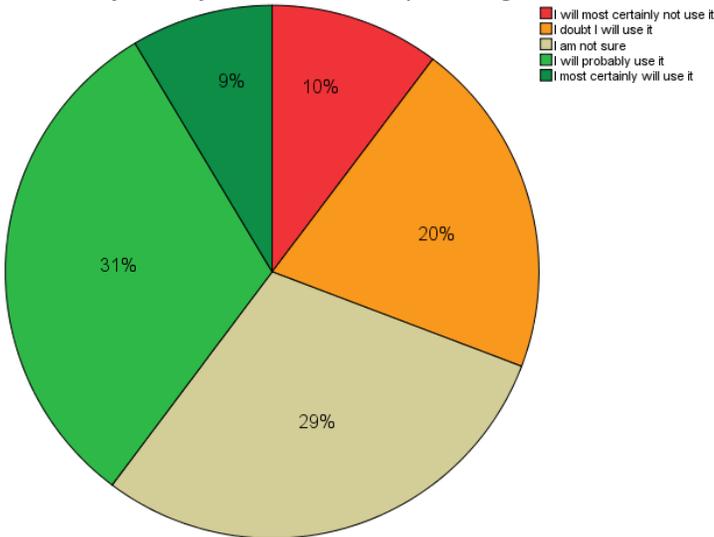
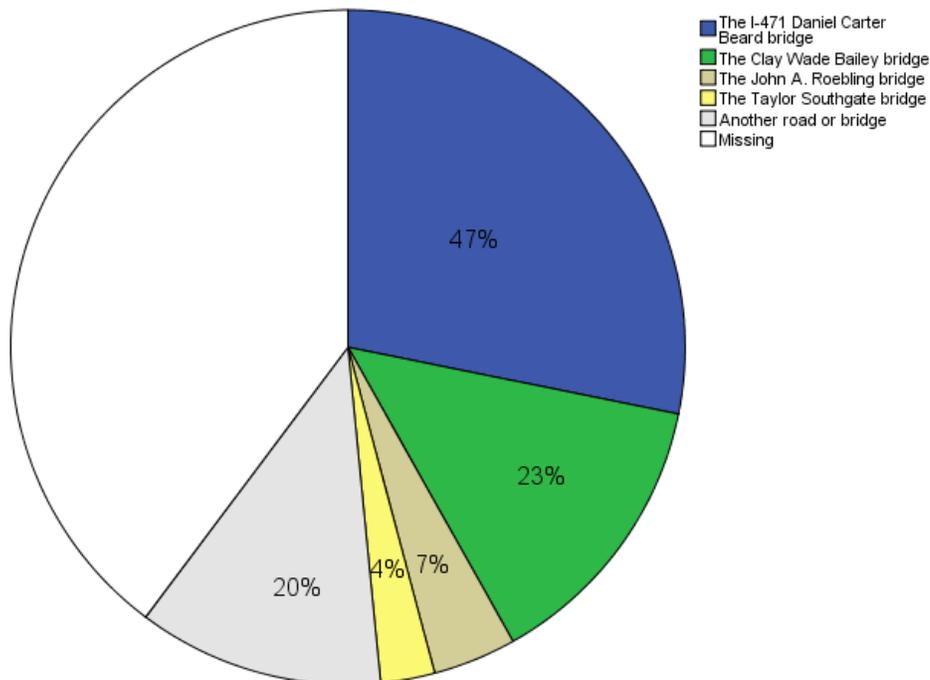


Exhibit 3-28 shows that 47% of those who may not use the tolled bridge elected for the Daniel Carter Beard Bridge as the alternate route option while 23% elected for the Clay Wade Bailey Bridge. These results are very consistent with the results displayed under **Exhibit 3-25** asking which bridge they would use if the Brent Spence Bridge was closed to traffic. In both cases, 47% indicated the Daniel Carter Beard Bridge as the preferred alternative, and 23-25% elected for the Clay Wade Bailey Bridge.

Exhibit 3-28: Alternate Bridge Used If Brent Spence is Tolled

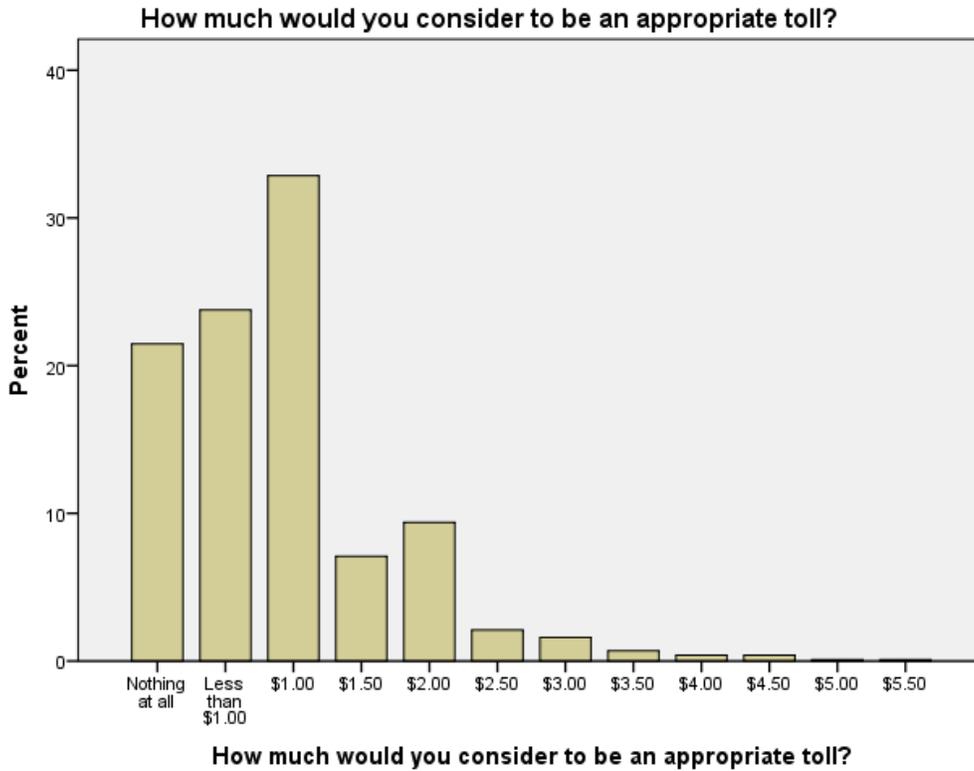
Which of the following bridges are you most likely to use if Brent Spence Bridge is tolled?



Note: The 40% "Missing" category represents the respondents who indicated they would keep using the Brent Spence Bridge (see Exhibit 3-27).

Respondents were also asked how much would they consider an appropriate toll to cross the bridge (**Exhibit 3-29**). The mean toll was \$0.91 while the median was \$1.00 (Exhibit 3-). Nevertheless more than 20% selected "nothing at all" when asked about an appropriate toll amount.

Exhibit 3-29: How Much Would You Consider an Appropriate Toll?



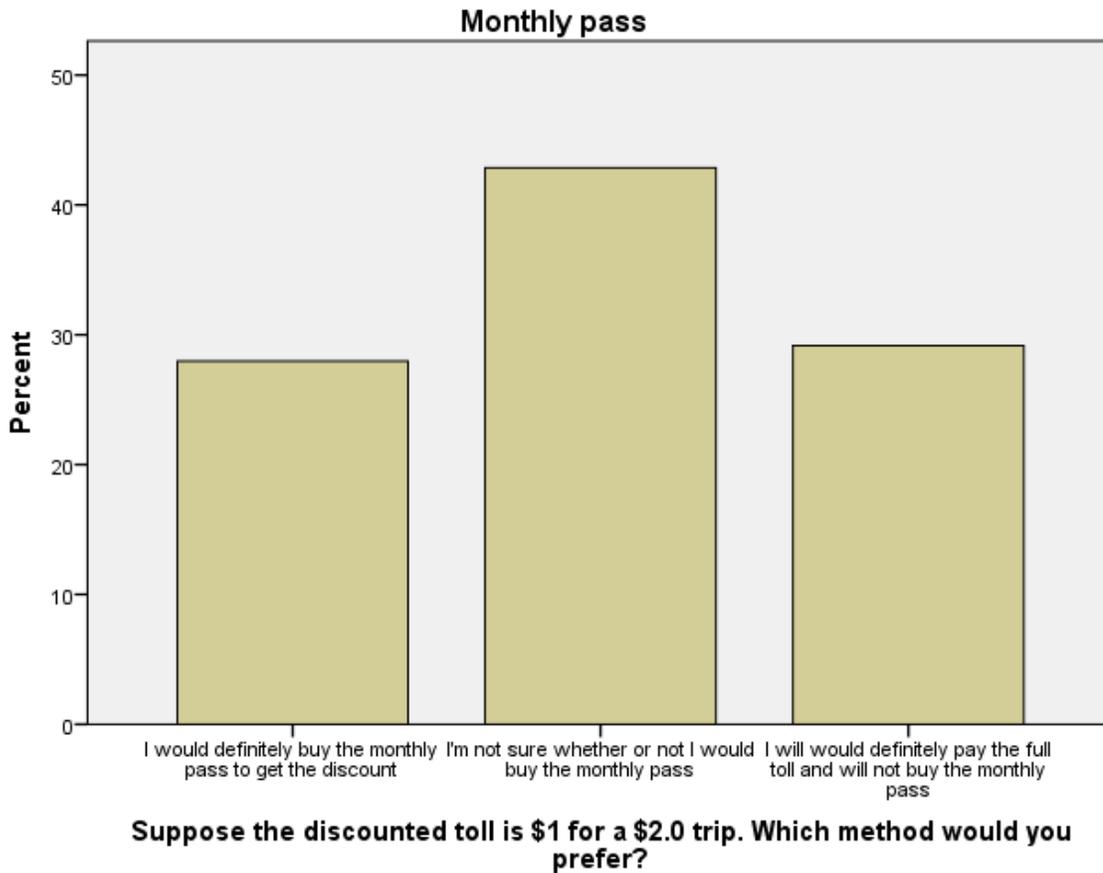
Respondents were also asked to tell us how much would the toll need to be for them to deem it 1) Too expensive, 2) Expensive, but would consider it and 3) A good value, they will use it. Results are shown in Exhibit 3-. \$3.00 was deemed too expensive by 50% of the respondent (median); \$1.75 was deemed expensive but would still consider using it and \$1.00 was seen as a good value. It is interesting to note that the modes (most frequent values) reported for too expensive, expensive but would consider it and a good value I will use it are \$5.0, \$2.0 and \$1.0 respectively; which are in cases higher than the median values reported above.

Exhibit 3-29: How Much Would The Toll Need to be for You to Deem it Too Expensive, Expensive or Good Value?

Toll amount stated preferences		How much would the toll need to be for you to deem it:			How much would you consider to be an appropriate toll?
		Too expensive	Expensive, but would consider it	A good value, I will use it	
Mean		\$3.72	\$2.34	\$1.65	\$0.91
Median (50 percentile)		\$3.00	\$1.75	\$1.00	\$1.00
Mode (most frequent value)		\$5.00	\$2.00	\$1.00	\$1.00
Std. Deviation		10.82	6.17	12.40	0.81
Percentiles	25	\$1.00	\$1.00	\$0.25	\$0.50
	50	\$3.00	\$1.75	\$1.00	\$1.00
	75	\$5.00	\$3.00	\$1.00	\$1.00
	80	\$5.00	\$3.00	\$1.50	\$1.50
	90	\$5.00	\$3.50	\$2.00	\$2.00

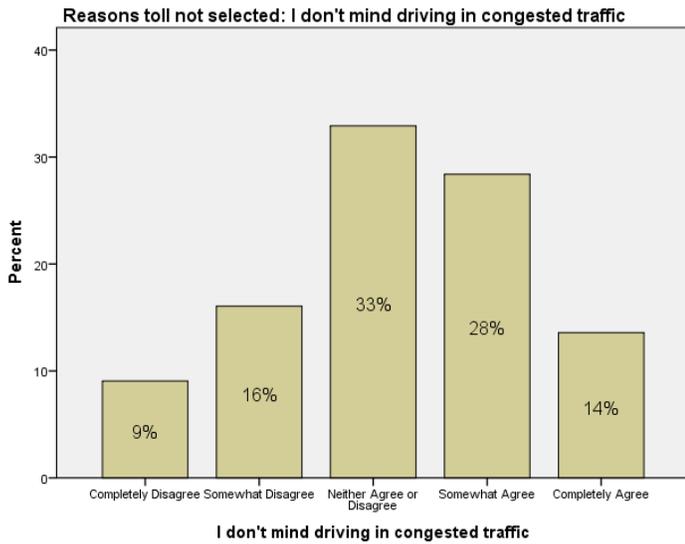
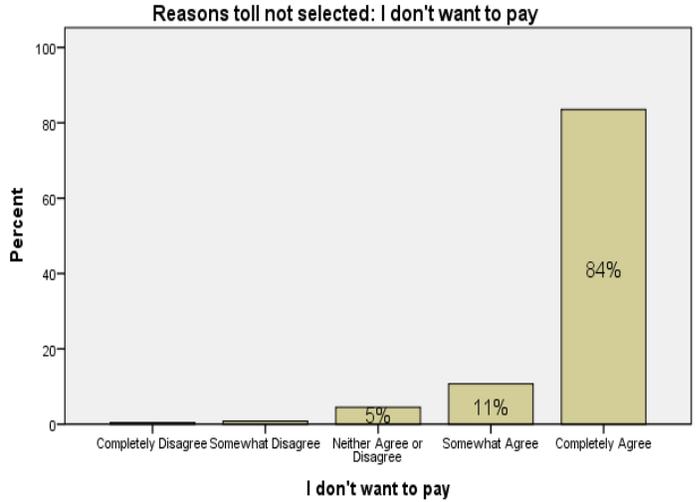
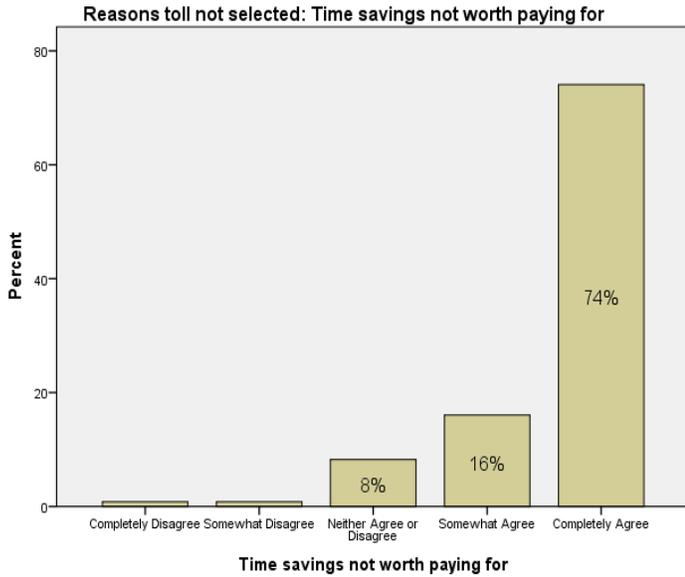
The preferred toll collection method was Electronic Toll Collection (ETC) for 85% of the respondents, while 15% elected for the video toll collection; when video collection was \$1 more expensive per trip. About 30% of the respondents would get a monthly pass if it offers a \$1 discount on a \$2 trip (**Exhibit 3-30**).

Exhibit 3-30: Monthly Pass Usage



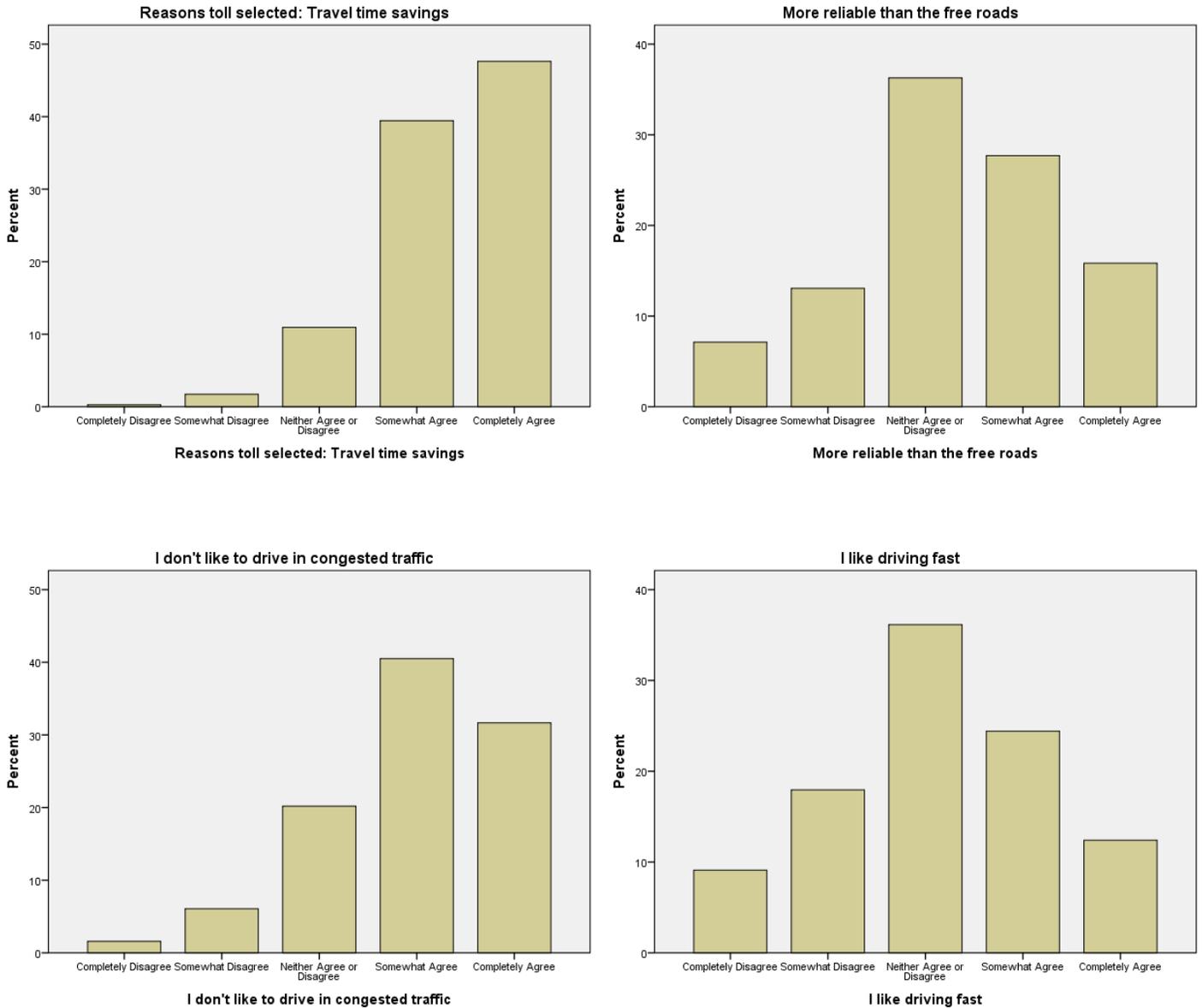
During the 9 SP choice exercise, presenting 9 trade-offs of cost and travel time savings ranging from \$2.0/hr to \$36/hr, 25% of the respondents always selected the free route alternative, indicating either a value of time of less than \$2/hr or, more likely, a personal bias against tolling. The reasons for never selecting the tolled bridge during the 9 choice experiments by these 25% respondents are reported in **Exhibit 3-31**. Most indicated that they simply didn't want to pay (95% agreement), while 90% of them indicated that time savings was not worth paying for. They also indicated that they don't like driving in congested traffic.

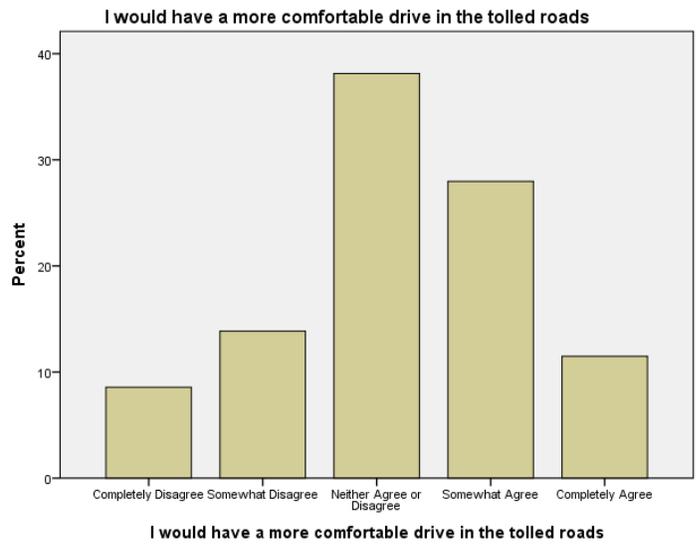
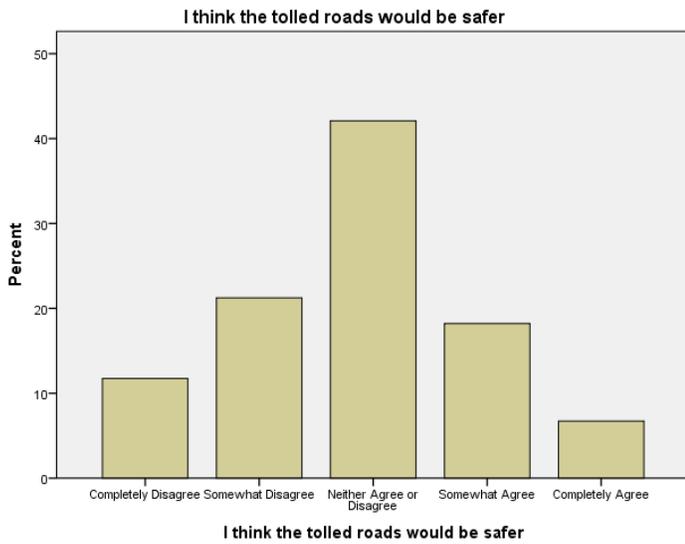
Exhibit 3-31: Reasons The Toll Bridge Was Not Selected



On the other hand, 75% of the respondents selected the tolled bridge alternative at least once. The reasons for selecting the tolled bridge are reported in **Exhibit 3-32**. Travel time savings, congestions and reliability were among the top reasons for selecting the tolled bridge.

Exhibit 3-32: Reason The Tolled Bridge Was Selected





A summary of the socio-economic and demographic characteristics of the respondents, their current travel conditions, their travel preferences and their attitude toward tolling was presented. In the next section, the results of the stated preference exercise to derive the value of travel time savings will be presented.

4. Preliminary Value of Time Results

Values of time are generally estimated at the market segment level using econometric models. In particular, binary logit-form choice models are being estimated based on a set of binary choices trading time and costs between using the new tolled bridge (faster but more expensive) and the alternate free routes (free but longer).

The survey data is currently being analyzed to estimate choice models that reflect the key variables influencing the choice of route. The key variables that determine the choice of route are:

- Travel time (Time);
- Monetary cost of the trip (Cost);
- The alternative specific constant that represents the net effect of other, unobserved attributes and capture a respondent's inherent preference that is not captured by travel time or monetary cost (Toll road constant).

While the time and cost coefficients are expected to be negative (as time or cost increase, the attractiveness of the route decreases), the toll road constant can be either positive (in favor of the toll bridge) or negative (against the toll bridge). Negative values for the constant may indicate a strong political bias against tolling in the region while a positive value may indicate advantages of the toll road that are not captured by travel time alone (such as increased reliability, comfort).

Preliminary value of time results, from the stated preference exercise, indicate value of time (VOT) averages in the \$12 to \$13/hr range. **Exhibit 4-1** shows preliminary values of time model results for the entire sample.

Exhibit 4-1: Preliminary Value Of Time Results - All Purposes All Income

Logit Models	Model without bonus		Model with bonus	
	Coefficient	T-statistic	Coefficient	T-statistic
Time	-0.326	-31.350	-0.320	-23.770
Cost	-1.540	-32.080	-1.549	-30.760
Toll bridge constant ¹	na	na	0.066	0.530
VOT (\$/hr)	\$12.69/hr		\$12.42/hr	
Toll bridge constant (min)			0.21min (~12 seconds)	

Interestingly, the toll bridge constant or toll bridge 'bias' is slightly positive (equivalent to a 12 seconds advantage to an alternate route with equal time and cost) but not significant (t-statistic less than 1.96). This may indicate that there is no particular bias, either against or in favor of tolling the bridge beyond purely time and cost considerations.

SDG is currently analyzing the data to present a more in-depth analysis of the value of time by market segments (purpose, income, etc.) and of its distribution across the population. The results will be summarized in a later memo.